

**THE**  
**WATER WHEEL**

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**STOP WASTING OUR  
WATER!**





**Implementing Environmental  
Water Allocations, 2009**

INTERNATIONAL CONFERENCE ON

## **IMPLEMENTING ENVIRONMENTAL WATER ALLOCATIONS**

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## **IMPLEMENTING ENVIRONMENTAL WATER ALLOCATIONS**

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Organised by the

**WATER RESEARCH COMMISSION (WRC), South Africa  
and the**

**DEPARTMENT OF WATER AFFAIRS & FORESTRY (DWAf), South Africa**

under the auspices of the

**World Conservation Union (IUCN)  
and the**

**International Association of Hydrological Sciences (IAHS)**

and with the support and co-operation of

**SA National Biodiversity Institute (SANBI)  
Department of Agriculture, South Africa**

**Department of Environmental Affairs & Tourism, South Africa**



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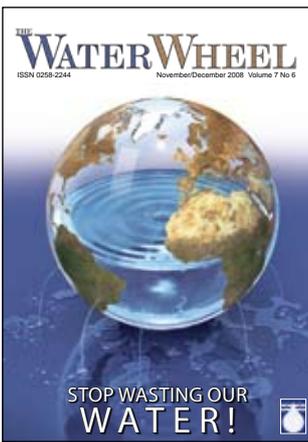
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*Cover: South Africans could do more to save water (See page 10). Cover illustration by Ralf Broemer.*

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## LETTERS TO THE EDITOR

**Information 'misleading'**

The letter received from Mr J Barnard of NMMU, 'Incorrect water treatment chemistry also causes problems', published in the July/August 2008 issue of *Water Wheel* (Vol. 7 No 4) is rather concerning.

Advocating that corrosive water can be remedied by merely adding lime to raise the pH can cause further reticulation problems if not properly controlled. Even when the pH is above 7,0 (alkaline), water can be strongly corrosive.

Keeping corrosion of a domestic water supply under control requires the control of both pH and alkalinity. If not properly controlled, corrosion or excessive scale (CaCO<sub>3</sub>) build-up occurs. A number of applications of Stability pH (pHs) exist: Langelier Saturation Index, Ryznar Stability Index and the Corrosivity Ratio.

Control of chemical stability: Soft waters (e.g. those in the Southern and Eastern coastal areas of the Republic) are corrosive and it is important that the purification process should include steps for stabilizing the water chemically by treatment with Ca(OH)<sub>2</sub> and CO<sub>2</sub>.

The letter is misleading and any students, trainee operators, reading it will be misin-

formed as to the correct procedures for remedying corrosive water in reticulation systems.

**RA Rowswell, Grahamstown**

**Costs of attending conferences sky high**

Working on my own, and having a lot to offer and more to learn in the water sector, I am keen to attend conferences and the like and to share and experience thoughts.

I have, however, come to the conclusion that it would be extremely difficult to do so. If one should, for instance, think of attending the very interesting and informative (hopefully!) Africa Water Congress in November 2008 that you advertised in *the Water Wheel* (September/October 2008 edition) it is expected that one pays from R5 000 for one of the two master classes to R20 600 for the three-day conference and two master classes! The conference alone will be a hefty R14 000 – all without lodging!

If one should furthermore have to travel from somewhere in Africa to South Africa, one's transport will have to be added to the fee.

All the above will make attendance to the conference – in a developing Africa for persons trying to enlighten themselves to what is ticking in the water industry nigh impossible. Must we not climb off or stop chasing the money spinning conference circuit and instead concentrate on trying to give back to the industry and persons practicing their intellectual value and plough back expertise and learning at true affordable cost?

Thank you for a very informative magazine!

**Hannes Buckle, specialist consultant, Weltevredenpark**

**Much more than you think**

The 'Sanitation by numbers' section on page 7 of the *Sanitation Supplement to the Water Wheel* Vol 7(5) refers. I would like to draw your attention to the first point where you state that a gram of faeces can contain 1 000 protozoan cysts and 100 worm eggs. This is a gross underestimate – by several orders of magnitude. My lab often records 40 000 or more cysts (we seldom even try to count them) and 100 000 eggs (sometimes more) in a gram!

**Chris Appleton, UKZN, Durban**

## Looking for Pumping Solutions?



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## SA water still cheap despite tariff increases

Despite being a water-scarce country, South Africa's water is still among the cheapest in the world, according to the latest international water report and cost survey by the NUS Consulting Group.

Among the 14 countries surveyed, only the US's water proved less expensive. This, despite the fact that South Africans are paying about 70% more for water than five years ago and about 9% more for water than a year ago. Germany claims top honours as the most expensive surveyed country in terms of water. It is generally thought that higher prices will make the consuming public more sensitive to water issues thus promoting greater conservation measures.

Interestingly, 11 of the 14 countries showed an increase in pricing. Australia experienced the largest year-on-year increase

in pricing at 18,5% (with South Africa experiencing the fourth-largest increase). Over the past two years, average water rates in Australia have grown by more than 35%. Australia's significant price increase was mainly attributable to prolonged droughts being experienced in the country.

"Given these developments around the world, medium to large business consumers of water can no longer rely on cheap and abundant supplies," reports NUS Co-President Richard Soutanian. "With fleeting opportunities for savings and the reality of ever higher prices, consumers must take an active role when it comes to their water purchases."

To access an abridged version of the survey, Visit: [www.nusconsulting.com/p\\_surveys\\_detail.asp?PRID=58](http://www.nusconsulting.com/p_surveys_detail.asp?PRID=58)

## Valuable lessons captured from national sanitation programme

A new publication, which offers valuable insight into lessons learnt from the National Bucket Replacement Programme, is now available from the Water Information Network South Africa (WIN-SA).

The programme, launched by national government in 2005, was aimed at replacing all the bucket toilets in South Africa. National Treasury allocated R1,8-billion over three financial years (2005 to 2008) for the removal of the bucket toilets. This was one of the largest allocations for any single government infrastructure project yet in South Africa.

A total of 80 water services authorities (WSAs) were involved in the programme and about 300 projects were undertaken to remove the estimated 252 254 buckets in use in seven provinces.

By the end of March 2008, more than 90% of the target number of bucket toilets had been eradicated through the programme. Most of the buckets were replaced by water-borne sanitation systems and some by alternative forms of sanitation, such as ventilated improved pit toilets.

According to the publication, compiled by WIN-SA and the Department of Water

Affairs & Forestry, the bucket eradication strategy had four primary elements: ensuring political support, strengthening national coordination, support to municipalities and risk mitigation (ensuring sustainability of replacement sanitation systems).

Lessons learnt have been categorised into institutional, technical and social lessons learnt. For example, the publication emphasises the importance of political buy-in and participation of the relevant communities. Communication between stakeholders is key.

Political approaches and the creation of expectations at higher levels have a major impact on the sanitation replacement options selected by the communities. "It was not always clear whether the beneficiaries fully understood the consequences of their preferred choices of sanitation system to replace the buckets," the authors point out.

Communities were generally reluctant to accept a lower form of sanitation than flush toilets unless they were confident that undertakings given by the WSAs, provincial or national departments to enhance the level of their services in future will be honoured. In addition, it is important for communities to take ownership of their new sanitation

systems, and the handover of projects and structures to take place as soon as possible after completion.

Some valuable lessons specifically for municipalities are also captured in the publication. To obtain a copy of the publication, *The National Sanitation Bucket Replacement Programme: Lessons Learnt*, contact WIN-SA at Tel: (012) 330-9076; Fax: (012) 4331-2565 or E-mail: [info@win-sa.org.za](mailto:info@win-sa.org.za)



Kathy Eales

## International recognition for municipal water monitoring system

The Department of Water Affairs & Forestry's efforts to improve municipal drinking water quality have been awarded internationally. The department, along with the Institute of Municipal Engineering and Emanti Management have been recognised internationally for the development of an electronic water quality management system (eWQMS) rolled out to all 166 municipal water services authorities in South Africa.

The eWQMS development team was bestowed the International Water Association Global Project Innovation Award in the Operations/Management category in Vienna, Austria earlier this year, after winning the regional awards. The Award recognise excellence and innovation in water engineering projects throughout the world.

Rollout of the open source, Internet-based system started in 2006. Today, around 95% of WSAs provide drinking water data on a monthly basis. Water quality and other

water service information is captured and stored on the central database. This information can then be easily retrieved via the Internet to generate reports, tables and graphs for management review and decision-making processes.

It is reported that the use of the system has contributed significantly to an improved level of awareness of drinking water quality matters, a growing improvement in effective drinking water quality management and a direct improvement in drinking water quality provision across South Africa. In one case, for example, a municipality's compliance to the national drinking water standard increased from 64% to 94% four months after it started using the eWQMS.

In May, Emanti Management also won the National Science and Technology Forum Award for Category E (Innovation developed through a small, medium or micro enterprise) for the eWQMS.

## Another heritage site for SA

One of South Africa's few true inland lakes, Lake Fundudzi, in Limpopo, is to be declared a national heritage site.

Situated in the mountainous area of Tshiavha village, the lake was formed by a landslide thousands of years ago, and plays a special role in the culture and tradition of the Vhavenda people. At present, special permission has to be obtained to visit the sacred lake from the Netshiavha royal family.

Lake Fundudzi is believed to be protected by a python god, who has to be pacified annually with gifts of traditionally brewed beer. According to legend a man who was broken hearted after the loss of his great love, walked into the lake and turned into a python.



The python is the god of fertility in the Venda tradition. Venda maidens still perform the famous Domba python dance to honour this god. It is also believed that there are 'zombies' who live near the lake.

## South African water savers sought

The Department of Water Affairs & Forestry has called for nominations for the 2008 Water Conservation and Water Demand Management Sector Awards.

Nominees are categorised and adjudicated according to the following sectors: agriculture; industry, mining and power; domestic or local government and forestry. Judging criteria include measurable impact, innovation, sustainability, economic benefit for the organisation and capacity building, among others.

The closing date for nominations is 14 November. For more information, visit: [www.dwaf.gov.za](http://www.dwaf.gov.za)

## WATER DIARY

### HYDROINFORMATICS

#### JANUARY 12-16

The IWA International Conference themed 'Science & Information Technologies for Sustainable Management of Aquatic Ecosystems' will be held in Concepcion, Chile. The conference combines the 7<sup>th</sup> Symposium on Ecohydraulics and the 8<sup>th</sup> Conference on Hydroinformatics. Enquiries: HIC 2009 Secretariat; Tel: +65 6356 4727; Fax: +65 6356 7471; E-mail: [hic2009@inmeet.com.sg](mailto:hic2009@inmeet.com.sg); Visit: [www.heic2009.org](http://www.heic2009.org)

### COMMUNICATION

#### FEBRUARY 18-21

The 2<sup>nd</sup> African Science Communication Conference with the theme 'Shaping Africa's Future: Science Communication's Contribution to Science, Technology and Innovation, and the Development of Democracy in Africa' will be held in Gauteng. Enquiries: Ms Maphefo Chauke, project officer, SAASTA, Tel: (012) 392-9300; Fax: (012) 320-7803; E-mail: [maphefo.chauke@saasta.co.za](mailto:maphefo.chauke@saasta.co.za)

### ENVIRONMENT

#### FEBRUARY 23-25

An International Conference on Implementing Environmental Water Allocations with the theme 'Making it Happen' will take place at the Feather Market Convention Centre in Port Elizabeth. Enquiries: The Secretariat (Cilla Taylor Conferences); Tel: (012) 667-3681; E-mail: [confplan@iafrica.com](mailto:confplan@iafrica.com); Visit: <http://ewa.innercirclestudios.co.za/downloads.html>

### WATER & ENVIRONMENT

#### MARCH 2-4

An International Conference and Exhibition on Water in the Environment (EnviroWater) will be held at the Protea Hotel in Stellenbosch, in the Western Cape. Enquiries: Dr Gunnar O. Sigge; Department of Food Science; University of Stellenbosch; Tel: (021) 808-3581; Fax: (021) 808-3510; E-mail: [sigge@envirowater.de](mailto:sigge@envirowater.de); Visit: [www.envirowater.de](http://www.envirowater.de)

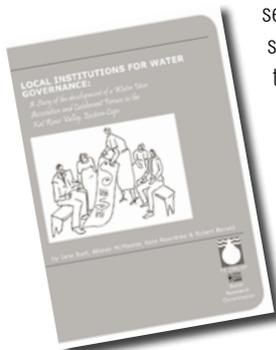
# New from the WRC

**Report No: TT 295/07**

*Local Institutions for Water Governance – A Story of the Development of a Water User Association and Catchment Forum in the Kat River Valley, Eastern Cape (Jane Burt; Alistair McMaster; Kate Rowntree and Robert Berold)*

This A5 booklet describes the development of water resource management organisations in the Kat River Valley from 1997 to 2006. The two organisations described here – the Kat River Valley Water User Association and the Kat River Catchment Forum – are given

separate narratives for the sake of clarity, although they developed in close association. Both these organisations were nurtured and supported as a result of a research process by members of the Catchment Research Group from the Department of Geography at the University of Rhodes with funding coming largely from the WRC.



**Report No: 1673/1/08**

*A Pilot Study into Available Upstream Cleaner Production Technologies for the Petroleum Refining Industry to Meet the Requirements of the Waste Discharge Charge System (HK Mazema; SH Ally; W Kamish and AM Petersen)*

The strategic and critical oil refining industry has undergone considerable economical and political changes. The current trend is towards more stringent environmental quality requirements for all refinery products. This project was initiated out of concern over the financial impact that the Department of Water Affairs & Forestry's new waste discharge charge system may have on industry. The report is divided into two parts, the first which provides an assessment of the cleaner production technologies available to the petroleum refining industry, and the second

which presents a first order assessment of the waste discharge charge system based on the available cleaner production initiatives.

**Report No: KV 211/08**

*Regional Description of the Groundwater Chemistry of the Kruger National Park (RC Leyland and KT Withüser)*

The Kruger National Park has adopted a Strategic Adaptive Management programme with clear ecosystem management goals based on environmental indicators and their thresholds of potential concern (TPC). TPCs are a set of operational goals that together define the spatiotemporal conditions for which the Kruger ecosystem is managed. Groundwater has been recognised as one of the environmental indicators that needs to be monitored and for which TPCs have to be developed in the park. A five-month project led by the University of Pretoria assisted the park to develop a strategic groundwater quality monitoring network and to set the TPC levels correctly and for an appropriate suite of constituents.

**Report No: 1431/1/08**

*To Calibrate and Verify a Predictive Model for the Incidence of Naturally Occurring Hazardous Trace Constituents in Groundwater (H Tarras-Wahlberg; P Wade; H Coetzee; S Chaplin; P Holström; T Lundgren. N van Wyk; G Nitsume; J Venter and K Sami)*

This report presents the findings of a project initiated to calibrate and verify a predictive model for the incidence of naturally-occurring hazardous trace constituents in groundwater. The overall objectives of the project are to provide a basis for the South African authorities to safeguard groundwater consumers from exposure to toxic trace elements, and to determine whether or not leach testing on representative bedrock, or reliable geochemical models can be used to predict natural groundwater contamination in different regions. The trace elements of interest are arsenic, chromium and uranium.

**Report No: 1402/1/08**

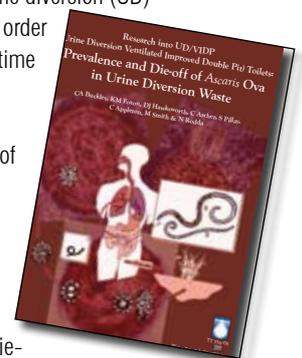
*Implementation of a Research Programme for Investigating Endocrine Disrupting Contaminants in South African Water Systems (AEC Burger)*

EDCs research has become of great importance worldwide. It was imperative that South Africa become involved in this field. The EDC research programme was compiled in order to coordinate and extend research done by several groups of researchers in the country. This report presents the EDC research programme pertaining to the investigation of EDCs in South African water systems.

**Report No: TT 356/08**

*Research into UD/VIDP (Urine Diversion Ventilated Improved Double Pit) Toilets: Prevalence and Die-off of Ascaris Ova in Urine Diversion Waste (CA Buckley; KM Foxon; DJ Hawksworth; C Archer; S Pillay; C Appleton; M Smith and N Rodda)*

*Ascaris* is the largest of the common nematode parasites of man. Adult worms can survive for one to two years and female worms can generate eggs for a period of one year while some may continue as long as 20 months. Diagnoses of helminth infection is normally through the detection of the eggs in the faeces. These eggs are highly infectious, and very robust. The present minimum standing period of the urine diversion (UD) toilet vault is one year. In order to ascertain whether this time period is safe for removal and handling of UD solid waste, reliable estimates of the egg load in the waste after a one-year standing period are needed. Therefore this study was undertaken to investigate the natural viability and die-off of *Ascaris* spp. ova in the UD solid waste, using the ammonium bicarbonate (AMBIC) protocol.



**To order any of these reports, contact Publications at Tel: (012) 330-0340; Fax (012) 331-2565; E-mail: orders@wrc.org.za or visit: www.wrc.org.za**

## New book on sustainability science



The CSIR has launched a new book which explores sustainability science from a developing world perspective.

The book is the product of research collaboration between the CSIR and several other South African and international research institutions. Edited by principal scientist Dr Mike Burns and CSIR Research Fellow Dr Alex Weaver, the book proposes a framework for ongoing sustainability science research within the region.

Explaining how the book came about,

Dr Burns argues that science has become isolated from the important aims of practically advancing sustainable development in practice. "Scientists have tended to confine themselves to their own research agendas, avoiding the difficult and value-laden issues of sustainable development that society faces," he says. "At the start of the new millennium, as the implications of unsustainable

development become increasingly apparent, the mode of science practice and, therefore its policy and practical impact, must change."

According to Dr Weaver, the new book is transdisciplinary in the sense that new insights are presented for responding to the challenges of sustainable development resulting from experimentation and the exchange of different disciplinary ideas for promoting sustainable development in southern Africa. Important in this regard has been the inter-

action between philosophers, system modelers, regional and urban planners, political scientists, anthropologists and ecologists.

## Cistern product saves water

Developed and manufactured in Wolseley, in the Western Cape, the Mr Flush Saver is a device that fits into the smallest of cisterns to save water when flushing the toilet.

The product is said to reduce the volume of water in a cistern by 1,1 l. Considering the average number of toilet flushes per household per day is around eight, then the savings per month is about 240 l or 2 800 l/year. This does not include the potential savings for high-volume areas such as hotels, shopping centres, entertainment entities, hospital and factories.

For more information, Tel: (076) 898-0772.

## New, more representative SANCOLD emerges

The South African National Committee on Large Dams (SANCOLD) has adopted a new constitution as part of its present restructuring process.

The new-look SANCOLD aims to be more inclusive, widely embracing and democratically representative of the dam community in South Africa. The committee, which has represented South Africa on the International Commission on Large Dams since 1965, has historically been viewed as an elite organisation, only narrowly representative of the true roleplayers in the industry.

Original members have included engineering-orientated organisations such as the South African Institution of Civil Engineers, the Institute of Municipal Engineers of South Africa, the South African Federation of Civil Engineering Contractors and Consulting Engineers South Africa (formerly the South African Association of Consulting Engineers). Other members include the Department of Water Affairs & Forestry, CSIR, and the South African Universities Vice Chancellors' Association.



Commenting on the restructuring, Dr Paul Roberts, who has been assisting SANCOLD in the process says: "Present water management trends, such as the move towards integrated water resource management as well the 2000 World Commission on Dams Report has emphasised the importance of a broader viewpoint on issues pertaining to dams. While ICOLD and SANCOLD have long paid attention to social and environmental issues related to water projects, there has been a realisation that we

needed to review our whole corporate governance. During this process it was agreed that we needed to broaden our membership base and, at the same time, be more democratically representative of South Africa's dam community."

For the first time, SANCOLD is opening membership to individual members. "We are particularly keen to include corporate and individual members from the earth sciences, as well as the social and environmental sciences," notes Dr Roberts. It is expected that the new membership will improve SANCOLD by bringing forth new ideas, especially from those disciplines which have hitherto not been represented. Individual members will benefit from being able to engage directly with the commission rather than having a more remote corporate representation via a representative body.

The restructuring process is expected to be complete towards the end of 2009. For more information, go to [www.sancold.org.za](http://www.sancold.org.za)

## New programme manager for global sanitation fund

Well known expert in sanitation and pro-poor financing for development, Barry Jackson, has been appointed the first Programme Manager of the Water Supply and Sanitation Collaborative Council's (WSSCC's) new financing mechanism, the Global Sanitation Fund (GSF).

Jackson joined WSSCC in September after 19 years at the Development Bank of Southern Africa where he served in several capacities, most recently as a senior policy analyst specialising in water supply and sanitation policy, municipal infrastructure finance and institutional development. "Barry's long experience in water and sanitation, together with his proven track record in innovative and creative financing which involves public and private actors and serves the poor, will contribute greatly to the success of the GSF," noted WSSCC Executive Director Jon Lane. Launched in March, the GSF is the world's first financing mechanism specifically for sanitation and hygiene. It aims to support national efforts to help large numbers of poor people attain sustainable access to basic sanitation and good hygiene practices. The fund has started work in Madagascar, Nepal and Uganda, Burkina Faso, India, Pakistan and Senegal.

## North America losing fish at alarming rate

Nearly 40% of fish species in North American streams, rivers and lakes are now in jeopardy, according to the most detailed evaluation of the conservation status of freshwater fish in the region in the last 20 years.



The 700 fish now listed represent a 92% increase over the 364 listed as 'imperilled' in the previous 1989 study published by the American Fisheries Society. Researchers classified each of the 700 fishes listed as either vulnerable (230), threatened (190), or endangered (280). In addition, 61 fishes are presumed extinct.

The new report, published in Fisheries, was conducted by a US Geological Survey (USGS)-led team of scientists from the US, Canada and Mexico, who examined the status of continental freshwater and diadromous (those that migrate between rivers and oceans) fish. "Freshwater fish have continued to decline since the late 1970s, with the primary causes being habitat loss, dwindling range and introduction of non-native species," said USGS Director Mark Myers. "In addition, climate change may further affect these fish."

The groups of fish most at risk are the highly valuable salmon and trout of the Pacific Coast and western mountain regions; minnows, suckers and catfishes throughout the continent; darters in the Southeastern US; and pupfish, livebearers, and goodeids, a large, native fish family in Mexico and the Southwestern US. Nearly half of the carp and minnow family and the Percidae (family of darters, perches and their relatives) are in jeopardy.

For more information, visit: <http://fish.er.usgs.gov/afs/>

## Emerging green economy could create millions of new jobs

Millions of 'green jobs' could be created in the coming decades as a result of the fight against global warming, according to a new study.

The new report, *Green Jobs: Towards Decent Work in a Sustainable Low-Carbon World*, says changing patterns of employment and investment resulting from effort to reduce climate change and its effects are already generating new jobs in many sectors and economies and could create millions more in both developed and developing countries. The report is a joint effort by the United Nations (UN) International Labour Organisation, the UN Environment Programme, the International Trade Union Confederation and the International Organisation of Employers.

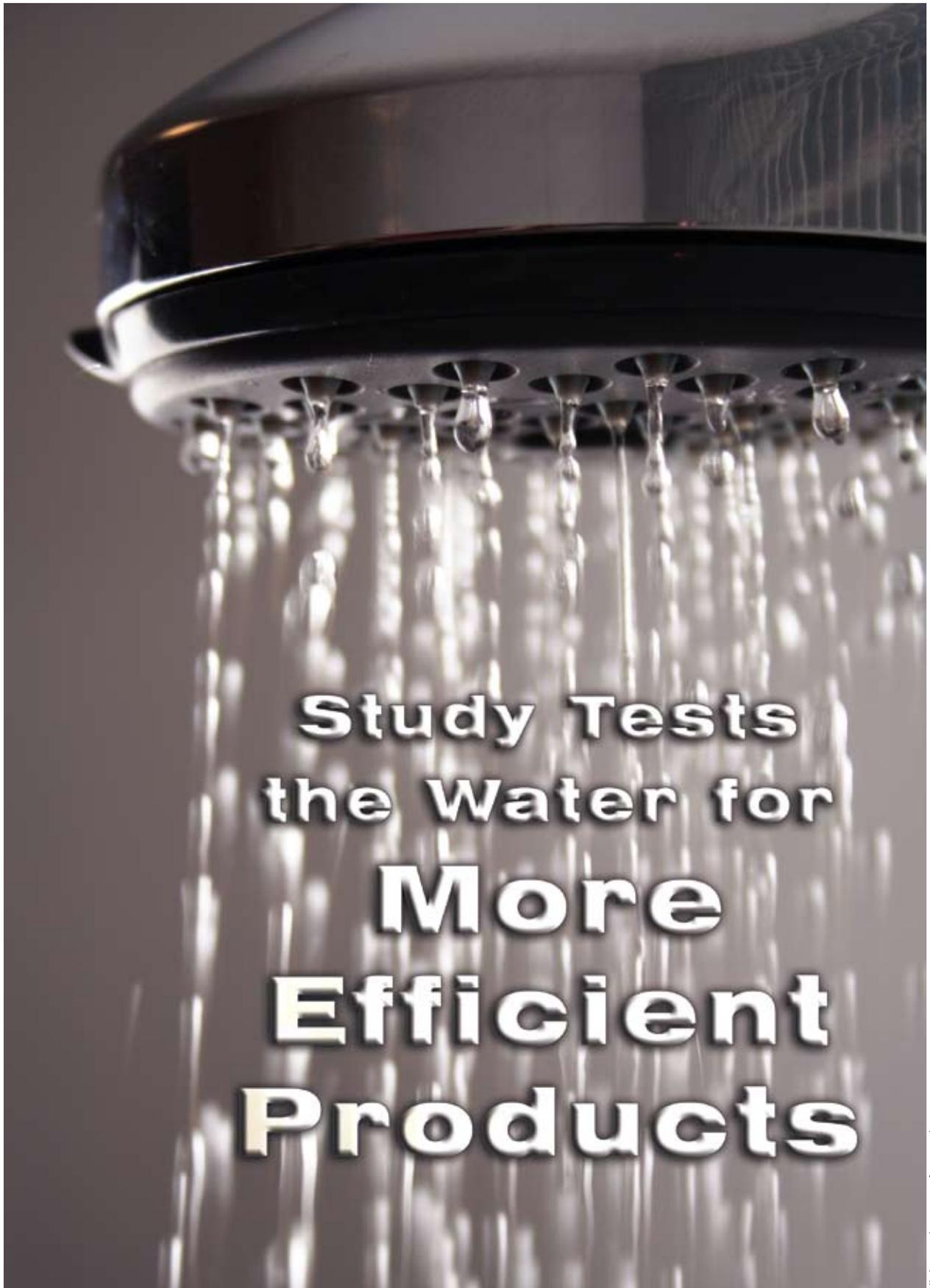
Though the report is generally optimistic about the creation of new jobs to address climate change, it also warns that many of these new jobs can be 'dirty, dangerous and difficult'. Sectors of concern, especially but not exclusively in developing countries, include agriculture and recycling where all too often low pay, insecure employment contracts and exposure to health hazardous materials needs to change fast.

Green jobs reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable. The report focuses on green jobs in agriculture, industry, services and administration that contribute to preserving or restoring the quality of the environment.

According to the report, the global market for environmental products and services is projected to double from US\$1 370-billion a year at present to US\$2 740-billion by 2020. Half of this market is in energy efficiency and the balance in sustainable transport, water supply, sanitation and waste management.

Sectors that will be particularly important in terms of their environmental, economic and employment impact are energy supply, particularly renewable energy, buildings and construction, transportation, basic industries, agriculture and forestry. Clean technologies are already the third-largest sector for venture capital after information and biotechnology in the US, while green venture capital in China more than doubled to 19% of total investment in recent years.

For more information on the green job initiative or to download the report, go to [www.ilo.org/integration/greenjobs/index.htm](http://www.ilo.org/integration/greenjobs/index.htm)



All photographs courtesy of [www.sxc.hu](http://www.sxc.hu)

***Living in an increasingly water-stressed country, South Africans need to become much more water efficient. This is one of the recommendations from a recently-completed study funded by the Water Research Commission (WRC).***

Traditionally, water consuming products, such as toilets, showers, washing machines, dishwashers, baths and taps have been designed with functionality, aesthetics and cost in mind. Little attention was paid to how much water these items used.

However, global concerns such as burgeoning population growth and rapid urbanisation amid increased water scarcity has prompted the realisation that water can no longer be used with reckless abandon, and sparked investigations into ways of using water more appropriately and efficiently.

There are many examples of water demand management and water conservation campaigns that have been implemented around the world: the city of Seattle in the US, for example, has reduced its water consumption by 1% each year over the last 23 years despite a 23% increase in its population. In southern Africa, the city of Windhoek has managed to reduce the average consumption from 320 ℓ per person/day to 220 ℓ per person/day over the last 30 years.

Closer to home, water conservation programmes carried out in the various municipalities supplied by Rand Water have seen the annual growth rate in the water supply to the water board's supply area reduce from 3,3% to virtually zero over the last three years, despite a concurrent 3,3% population growth rate. Cape Town, which has been through several years of water stress in the last few years, has developed a holistic water conservation strategy, which includes the promulgation of the

**Left:** *It is relatively easy and inexpensive to swap out shower fittings with more water efficient products.*

most comprehensive water conservation bylaws in South Africa.

The WRC-commissioned study, conducted by Partners in Development (PID), included four surveys in order to gauge the status and use of water efficient devices in South Africa. Firstly, commercial and institutional settings such as hotels and hostels were investigated; secondly, the suppliers of plumbing fittings were studied; thirdly the architectural profession was surveyed; and finally the knowledge and attitude of 1 428 home owners in ten towns and cities across South Africa were tested.

### INCREASED AWARENESS

According to project leader David Still the study found clear evidence that water efficient devices are becoming more common. "From the City of Cape Town's programme to replace all the automatic flushing urinals in public buildings and install Hippo Bag displacement devices in all the old large capacity school toilet cisterns, to the sophisticated infrared operating taps and urinals that are becoming standard at airports, there is a move towards water saving and water efficiency," he says.

**"We have the legislation and policies in place, however, we lack the capacity to drive the process."**

Speaking at the 10<sup>th</sup> Annual Water Distribution Analysis (WDSA) Conference, held in the Kruger National Park in August, Still noted that the larger hotel groups were signing on to

environmental programmes, one of whose components is sustainable water use, and that there were encouraging examples where university hostels and other public buildings were being retro-fitted with water-saving cisterns, taps and showers.

Some of the worst offenders for high water usage are government buildings. For example, among the 50 highest water users in Pietermaritzburg, in KwaZulu-Natal, are several public schools which do not have boarding establishments. It is therefore felt the State should take the lead by ensuring its buildings are as water efficient as possible. "This would have an impact on the civil service, which employs over a million people, and the population at large, which would see the State leading by example," said Still.

### LOCALLY AVAILABLE PRODUCTS

The increasing market share of water efficient devices is apparent on the showroom floors of the major plumbing suppliers. This is almost in spite of the suppliers, who as a rule do not push water efficiency. "The reason aerated taps, dual flush toilets, water efficient baths, basins and showers are increasingly being sold, is that these are becoming the standard in the countries of manufacture in Europe and the East. While South Africans are sometime still wary of six-litre flush toilets these, or even more efficient designs are now the standard in parts of the US, the UK and Europe," reported Still.

According to Jay Bhagwan, WRC Director: Water Use and Waste Management, lack of strong enforcement and regulation remain the greatest challenges in South Africa. "We have

## MAIN RECOMMENDATIONS FROM THE STUDY

### Government must lead by example

The State landlord, the Department of Public Works, should embark on an audit of water usage and the presence of water efficient devices in all buildings under their care. This would have an impact on the civil service, which employs over a million people, as well as the population at large, which would see the State leading by example.

### SA needs a labelling system for water efficient devices

South Africa should emulate the water efficiency labelling system practiced in other countries, of which the most advanced appears to be the Australian WELS label. The label is not just a general 'green' label, but includes product specific information and a graded rating from 0 to 6 stars.

### SA needs a nationally sponsored public education campaign regarding water efficient devices

The State needs to make a case for water saving with the public. This campaign should appeal both to the public's sense of civic duty (it is the right thing to do), while not underestimating their intelligence (answering questions like "Why don't we just building bigger dams?" and "If I am prepared to pay for what I use why can't I use as much as I want?").

### Information on water efficient devices must be easily obtainable

The public and even the building industry are still relatively ill-informed about water efficient devices. Water conservation in the built environment should be taught at undergraduate



level to architects and at FET colleges to plumbers. Water saving tips should be regularly distributed with municipal accounts, and should be displayed in appropriate locations.

### Municipal bylaws must include provisions relating to water efficiency and water conservation, and ideally there should be convergence across municipalities

It would help if there was more consensus between municipalities on water bylaws, particularly in the case of a large conurbation such as Gauteng, which spans several municipal jurisdictions.

### Building codes and bylaws must converge

Bylaws relating to the types of showers, baths and toilets installed in houses are really only enforceable for new housing stock, and even then it seems unlikely that municipalities have enough building inspectors to do this work adequately. It would be far simpler to inspect at the source, i.e. to control what products are sold by the plumbing suppliers.

A section needs to be added to the building code to bring it into line with

modern water efficient good practice. If this was done, then the suppliers and specifiers would be able to follow without worrying that they are out of line with standard practice.

### Retrofit programmes with rebates (where appropriate) should be encouraged

In South Africa there are many millions of poor people who are not required to pay for their water supply. While the official policy guideline is that each family should get a lifeline amount of water of 6 kℓ free, in some urban areas the reality is that no water is paid for. For people in these areas there is no incentive to conserve water. In such areas, it may pay a municipality to intervene with schemes to retrofit water efficient devices, even if the full cost were to be borne by the municipality.

### Water supply pressures must be decreased

Water supply pressures in South Africa are, in general, far above international norms. No more than four bars of pressure is needed for domestic water supply, and municipalities would save both themselves and their customers money if they took steps to regulate the pressure in their systems down to this level.

### Informative billing

Even educated customers take little time to attempt to understand or analyse their utility bills, which typically combine water, electricity, refuse removal and sewage charges. With modern technology it would be possible to include simple graphic information, such as a graph showing how water consumption has varied from month to month for the last 12 months. With such easy to read, visual information, consumers can be more easily alerted to leaks or wastage on their properties.

the legislation and policies in place, however, we lack the capacity to drive the process." Bhagwan believes more drive needs to come from the broader society, since water wastage affects us all. "Inefficient use of water is a bad disease which can severely impact our water security in future."

**ANTIQUATED BUILDING CODE**

While there is some evidence that architects are moving towards an awareness of sustainable water use, the building profession in general is still quite conservative, with a strong tendency to stick to tried and tested products. This sector is guided strongly by the building code, and the view of respondents to the survey was generally that only if the building codes were changed would they consider implementing more water saving devices.

**"The penetration of water efficient devices into the South African domestic market is going to be slow and gradual, probably taking a generation or two to become the norm."**

Therefore one of the recommendations from the study is that a section needs to be added to the building code to bring it into line with modern water efficient good practice and legislation. "If this was done, then suppliers and specifiers would be able to follow without worrying that they are out of line with standard practice," said Still.

**FINANCIAL CONSIDERATIONS**

The 1 428 homeowners surveyed came from a range of socio-economic backgrounds in ten South African cities and towns. A total of 29% of these homeowners indicated that they already had at least one water efficient device in the home.

**WHAT IS A WATER EFFICIENT DEVICE?**

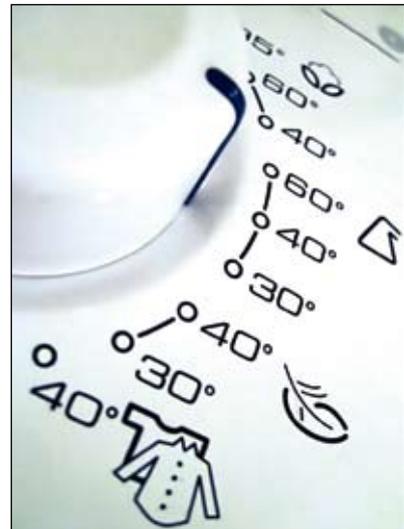
**A water efficient device is one which serves the same function as its standard alternative, without any reduction in performance, while using less water.**

Typically, only about 20% of the respondents in the average town believed they might possibly use too much water, but significantly more (nearly 50%) have considered reducing their water consumption.

According to the study, the factors which prevent people from installing water efficient devices include a lack of knowledge about water efficient devices, the fact that they might not own their own home (renting), or that they cannot afford to make changes, among others. "Conversely the conditions which would persuade people to move to water efficient devices include an increase in the price of water, if rebates were offered for the installation of water savings devices, if there were water restrictions, if they had a better understanding of water efficient devices and if the use of hosepipes was banned."

Whereas it makes economic sense to install water efficient devices in new buildings, the economics of retrofitting water efficient devices to existing housing stock is very variable, depending on the device and setting in question, the project team found.

The quickest and cheapest water efficiency retrofit measure for the domestic market is the aerated shower head. "It is relatively easy and inexpensive to swap out shower fittings and these will



Many water efficient products are now available on the market.

typically pay for themselves in water savings in a few years," noted Still.

However, the economics of changing out toilet cisterns and pans is rather less attractive, unless they are in a setting where they are used by more users than would be found in the average home. "For this reason, large-scale changes to the existing housing stock are unlikely, and therefore the penetration of water efficient devices into the South African domestic market is going to be slow and gradual, probably taking a generation or two to become the norm," reported Still.

To order the report, *The Status and Use of Drinking Water Conservation*



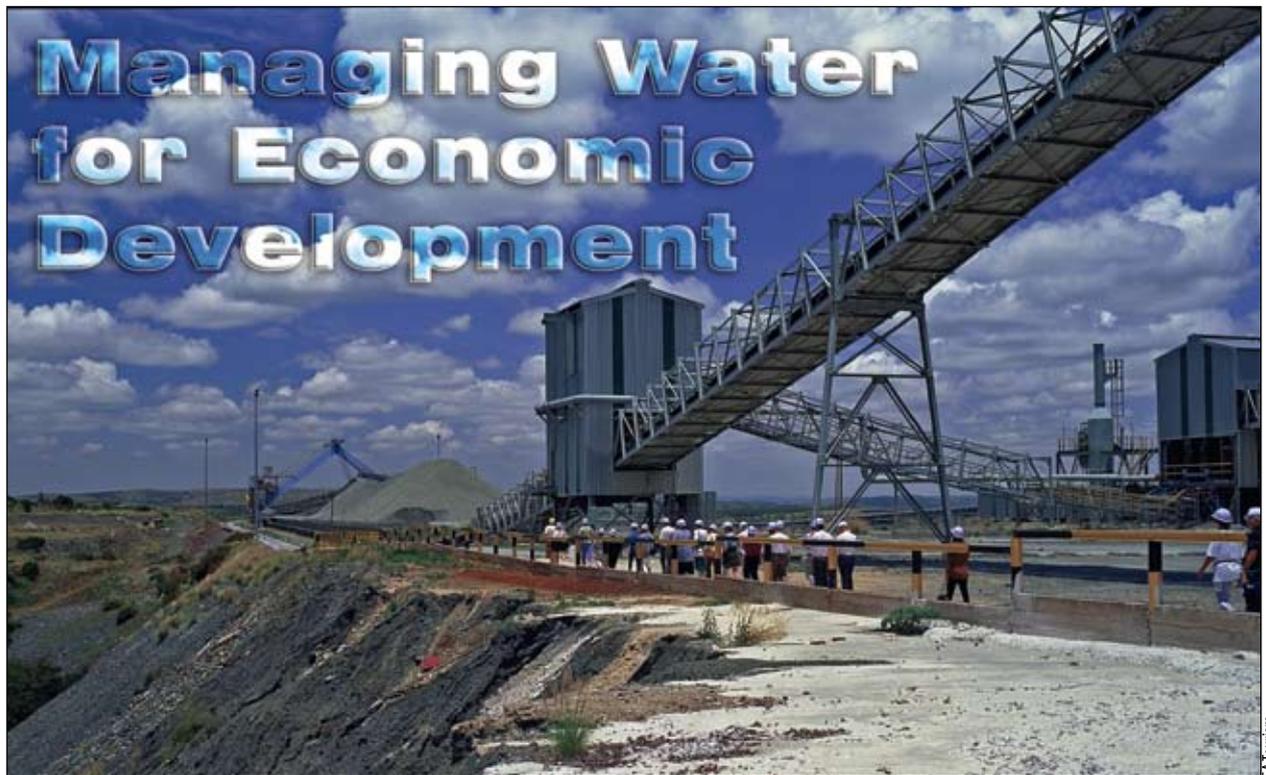
*and Savings Devices in the Domestic and Commercial Environments in South Africa*

**(Report No: TT 358/08)**

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*The recent completion of a strategic investment framework has provided new impetus to the Water Research Commission (WRC)'s research area focusing on the interaction between water and the economy.*

Government's strides in growing the South African economy have resulted in an increase in the demand for water and underscored the role of natural resources in building national wealth. However, the country's potential water yield (i.e. water supply) is finite and options to develop feasible new water schemes are limited.

The implementation of the National Water Act (NWA) in 1998 has to date not been able to significantly reverse the water use efficiency trend, hence, management of the existing supply and demand for water is a major obstacle of water policies in South Africa and in need of supporting research.

Existing scarce resources are further reduced by poor water quality as a result of industrial, agricultural and domestic pollution. Many of the country's river systems have become waste sinks for dissolved salts, nutrients, bacteria and

industrial pollutants such as inorganic materials, metals and organic compounds.

Salinisation and eutrophication are two of the major water quality problems the country faces. Another is bacteriological contamination as a result of poor maintenance of sanitation facilities, which not only impedes economic development, but also risks human health and well-being.

The WRC has funded valuable research on the economics of water management in South Africa. A stage had been reached to review what had been done and to evaluate it within the context of national needs and priorities. The outcome of such an evaluation would provide the WRC with strategic guidance concerning the investment strategy it should adopt up to 2010 for water and economy-related research.

Consultant De Wit Sustainable Options was contracted to compile the strategic document. Based on an evaluation of national research needs, existing WRC-funded research, a literature survey and an expert opinion survey, three overarching thrusts for the period 2007-2010 have been identified: the role of water in economic development, the use of economic instruments in the management of water, and research on the complex inter-relationships of water-economy systems.

## **WATER AND ECONOMIC DEVELOPMENT**

The ever-mounting scarcity of freshwater in South Africa within the context of an expanding economy and, thus, increasing demand will need informed choices on water allocation between competing needs. There are two general choices to address this problem: either increase supply or reduce demand.

With a renewed focus on public infrastructure development in South Africa the question needs to be answered through research what the best possible economic allocation of scarce resources to, or costs and benefits of alternative shorter and longer term water management options are, including enhancing supply and managing demand. A second and related question is whether South Africa's water resources are sufficient to support planned economic developments and what the sensitivity of such economic development plans are to changing assurances of supply, changing water prices and implementation of water conservation regulations and technologies.

A third and fourth question relate to the role of water in the alleviation of poverty (such as the evaluation of the economic viability of emerging and small business in the water sector) and to evaluate the economics of water service delivery, including water supply and sanitation.

## MANAGING WATER WITH ECONOMICS INSTRUMENTS

The next key element of the strategic framework is the question of how to apply economic instruments in the management of water. The first research question is at what (volumetric) levels water tariffs should be set to influence use and how sensitive water demand is to changes in water tariffs, moving beyond single-point estimates on water valuation (elasticity).

Also, through research, non-market valuation techniques need to be applied to estimate the demand for those water-related ecosystem goods and services not traded in markets. Estimating the benefits of healthy water-related ecosystems and applying these to estimate the economics of the Reserve are two topics in need for further research.

A third question is what the economic benefits of clean water and the cost of addressing polluted water are. To achieve levels of water pollution that do not cause long-term damage while leaving space

for development; research on the damage costs and unit control costs for key pollutants and key polluting sectors is needed.

Further research is also required on the prerequisites for efficient water allocation, specifically the accurate and cost-effective measurement of water use as well as the institutional economics of water rights and licenses. In addition, the framework identified a need an economic evaluation of water policies and the application of economic policy instruments to water management.

**“Economic appraisal, the economics of demand-side management and the use of economic instruments for water management should receive higher priority than in the past.”**

Lastly, a regulatory impact assessment on the NWA is proposed, as well as practically focused research on the feasibility of water markets and (waste) water charges.

## WATER-ECONOMY SYSTEMS

It has been recognised that the causal relationship within complex water-economy systems needs to be explicitly recognised and their sensitivity to biophysical and socio-economic change tested. Water needs to be managed for multiple uses in a sustainable manner. Integrated assessment and multidisciplinary modelling approaches are needed to provide a systems-wide perspective on the management of water resources.

Proposed research topics include investigating sensitivity of socio-economic activities to extreme events and/or gradual changes on water resource availability and quality (e.g. climate change and changes in assurance of supply, droughts, floods, longer term salinity build-up, impacts of invasive species) and to develop a prototype

integrated economic model accounting for supply and demand for water in stressed catchments.

The proposed investment framework was further compared to existing research in the WRC's water and economic domain. A clear fit was found between existing work and planned future work, minimising disruptions to existing programmes. The WRC runs a diverse water and economy research portfolio. Present research includes determining the value of estuary services, producing an econometric model to predict the effect that various water resource management scenarios would have on South Africa's economic development, development of a model to assess the costs associated with eutrophication, examining financial sustainability of sanitation services, and investigations into productive use of domestic water for sustainable livelihoods, among others.

Existing work has been reorganised into the investment framework for 2007-2010, providing a clearer focus on practical outcomes that will support the further implementation of the NWA and associated initiatives (e.g. the water reallocation process).

It was also found that no earlier economic research has been done on complex water-economy systems and that economic appraisal, the economics of demand-side management and the use of economic instruments for water management should receive higher priority than in the past. The critical scarcity of water resource economists South Africa is experiencing at present, which limits existing research capacity, has also been emphasised.

It is hoped that this strategic investment framework will provide the context for research on water and the economy that is sufficiently practical to inform the decisions on South Africa's chosen road of water reform, while employing the theoretical principles and applied techniques in the subject field of economics. 



Lani van Vuuren

## THUKELA-VAAL TRANSFER SCHEME:

The 51 m-high Woodstock Dam has a gross storage capacity of 381 million m<sup>3</sup>.

# Feeding the Hungry Heartland

*Thirty years on, the Thukela-Vaal Transfer Scheme, which pumps millions of litres of water from the resource-rich Thukela catchment up and over the Drakensberg escarpment to the water-stressed Vaal, is still regarded as one of South Africa's engineering marvels. Compiled by Lani van Vuuren.*

The 1960s were a decade of unprecedented economic growth in South Africa. Between 1962 and 1967 the average growth rate in the production of services and goods was 6,3%. Most of this growth was in the economic heartland of the country (then known as the Pretoria-Witwatersrand-Vereeniging complex). As economic growth took place the demand for water grew. The area received most of its water from the Vaal River system, which was by then already a hard working river.

Other large users of the Vaal River's resources included Sasol, Iscor (known today as Arcelor Mittal South Africa), the Electricity Supply Commission (Eskom), Orange Free State Goldfields, Western Transvaal Regional Water Company (known today as the Midvaal Water Company), the Vaal-Gamagara Government Water Scheme, the Vaalhartz irrigation scheme and various towns.

Drought conditions experienced between 1960 and 1966 caused the Minister of Water Affairs to impose water restrictions in the PWV area for the first time in decades. While satisfactory rains allowed these restrictions to be lifted in February 1967, they were re-imposed from February to November 1969. Between October 1970 and November 1971 and in 1973 the area also faced restrictions, contributing to the stagnation of industrial investment in the region.

At that stage the storage capacity of the storage schemes on the main stem of the Vaal River was 4 100 million m<sup>3</sup>, capable of supplying 1 545 million m<sup>3</sup>/year on a dependable basis. However, the demand for water from the Vaal was to reach 1 600 million m<sup>3</sup>/year by 1976, and the realisation dawned on authorities that something needed to be done.

## ALL EYES ON OTHER CATCHMENTS

In a paper published in *The Civil Engineer in South Africa* in August 1982 TPC Robbroeck, then Managing Engineer (Water Resources) in the Department of Water Affairs (DWA) wrote: "Apart from the limited raising and strengthening of the Vaal Dam... raising of the other dams was found to be unsatisfactory and uneconomic. Most of the water that would have been gained would have been lost because of the increased surface area exposed to evaporation. Indirect re-use of water was already taking place to the fullest extent possible and the only other feasible source for augmentation was inter-basin transfer from neighbouring catchments."

By the 1960s negotiations with Lesotho to construct the Lesotho Highlands Water Project (LHWP) had already started, but was proving difficult and lengthy. In the meantime, demand kept growing. Attention subsequently became focused on the upper reaches of the Thukela River, several 100 metres below the headwaters of the Vaal and flowing in the opposite direction (towards the Indian Ocean).

Robbroeck explains that other suitable neighbouring rivers considered were the Usutu and Komati rivers, but these were already being developed for water supply to Eskom's new power stations on the eastern Highveld. The remaining neighbouring rivers were tributaries of the Limpopo, the water resources of which were already being exploited. Thus, in June 1970, the first phase of the Thukela-Vaal Transfer Scheme was approved by the then Minister of Water Affairs, Fanie Botha.

## FIRST PHASE

The original layout of the scheme comprised a dam at Spioenkop, two pumping stations and a pipeline conveying water along an aqueduct (comprising 37 km of rising main, 28 km of canal, 5,5 km of inverted siphons and 12 km of tunnels) which would discharge to the basin of the proposed Java Dam on the Elands River, near Harrismith.

Construction of the Spioenkop Dam subsequently kicked off in 1968. However, when it was discovered that the proposed Java Dam would flood a large part of the then planned Qwa-Qwa National State, the scheme had to be completely replanned. A new site for the reserve storage dam was found at the farm Sterkfontein on the Nuwejaarspruit – a tributary of the Wilge River. "This site was so close to the watershed near Oliviershoek, and on such a minor tributary, that initially it was not believed possible that it could command the required 2 000 to 3 000 million m<sup>3</sup> capacity; the capacity curve was recalculated several times to make sure!", writes Robbroeck.

The basin was found to have a remarkable shape in that it had a wide bottom through which the river meandered at a flat gradient and was surrounded by steep slopes.



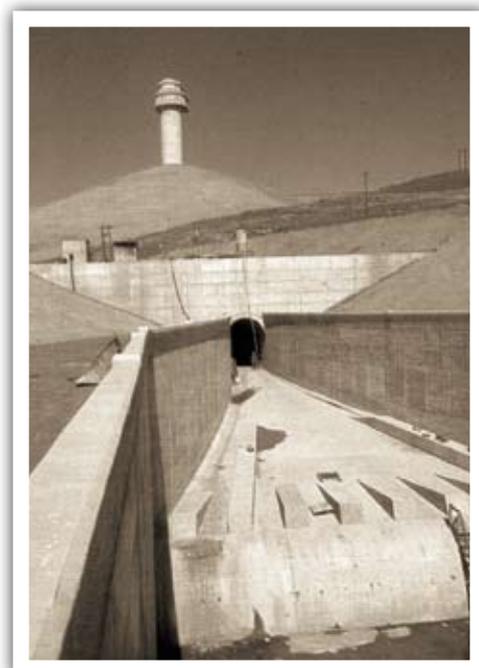
DWAF

*Driekloof Dam features a concrete spillway slab with multiple baffles on the downstream slope.*



DWAF

*Constructed during the first phase of the Thukela-Vaal Transfer Scheme, the Driel Barrage has a capacity of 18,3 million m<sup>3</sup>.*



DWAF

*The outlet works of the Sterkfontein Dam have a capacity of 220 m<sup>3</sup>/s.*



*Driekloof Dam, which has been constructed across an arm of the large reservoir formed by Sterkfontein Dam.*

Construction of the dam started in 1971 and at the time it was the largest earthfill embankment dam to be built in South Africa. The embankment is a typical earthfill design 2 290 m long with an impervious core sloping upstream. The dam had an original height of 68 m and a gross storage capacity of 1,2 million m<sup>3</sup>.

The main challenge on the site was to make use of the fill materials which were quite variable (mainly weathered mudstone, shale and dolerite). This gave rise to the rather flat upstream slope. Due to its small catchment area with negligible natural inflow the dam required no spillway, which made it pretty unique.

Evaporation losses from Sterkfontein Dam are about 35 million m<sup>3</sup>/year, which represent about 10% of the losses that would be experienced from Vaal Dam for a similar volume. When the dam was completed in 1977 it was the only dam in South Africa to qualify for inclusion in the International Commission of Large Dams (ICOLD) Register of the World's Largest Dams.

Also added to the first phase of the Thukela-Vaal Transfer Scheme was the Driel Barrage with a capacity of 18,3 million m<sup>3</sup> immediately below the confluence of the Mlamboja and Thukela rivers. The Spioenkop Dam would now serve to re-regulate the flow of the Thukela River for downstream users, since all the low flow was now to be abstracted at Driel.

Following the completion of the first phase in 1974, up to 330 000 m<sup>3</sup>/day of water was lifted 506 m by means of four

vertical-spindle, centrifugal pumps, each with a capacity of 110 000 m<sup>3</sup>/day. The 3 915 m-long rising main, which varied in diameter from 1 500 mm to 1 700 mm, took the shortest route directly up the mountain to end in an aqueduct consisting of 9 350 m of canals and 1 711 m of tunnels, the main one through the watershed between the Thukela and Vaal on the aptly-named farm Tzamenkomst. This aqueduct emptied into the Sterkfontein basin. The first phase was completed at a total cost of R41,7-million.

## SECOND PHASE

Meanwhile, the volume of economic activity continued to grow explosively in the PWV complex and, in 1974, the DWA proposed extending the Thukela-Vaal Transfer Scheme. Initially, the second phase was planned to increase the transfer rate to 11 m<sup>3</sup>/s, corresponding to 950 000 m<sup>3</sup>/day. The canals and tunnels had already been constructed to that capacity so that only the pump stations at Driel and Jagersrust would have to be duplicated as well as the associated rising mains and the Mpandweni siphon.

In addition, a further storage dam, capable of regulating the Thukela River upstream of Driel was needed to assure a constant withdrawal at the rate required. A site for such storage was found at Woodstock farm. This dam, in combination with Driel, would permit a constant 504 million m<sup>3</sup>/year to be drawn, more than needed for the second phase.

Once completed the 51 m-high Woodstock Dam would have a gross storage capacity of 381 million m<sup>3</sup>. For the design flood the total spillway capacity required 1 000 m<sup>3</sup>/s, of which 500 m<sup>3</sup>/s could be discharged through the tunnel. An additional spillway with a capacity of 500 m<sup>3</sup>/s had therefore to be built.

Writing in the 1982 *Civil Engineer* HFW Elges, DWA Assistant Chief Engineer (Design) says: "This spillway was placed on the left flank and the original design comprised a straight ogee crest, a converging channel and a 15 m-wide chute discharging the water back into the river downstream of the dam. However, hydraulic model tests revealed that the waves formed in the chute were unacceptable. The solution was a curved ogee spillway section, a transition zone with a floor elevated along the centre line and an 11 m-wide chute. The energy dissipating device at the end of the chute is of the flip bucket type. An auxiliary spillway to handle floods up to 2 730 m<sup>3</sup>/s at the dam wall was also provided on the far left flank adjacent to the chute spillway."

Construction of this embankment dam was relatively short, starting in March 1979, with river diversion in April 1980 and impounding starting in March 1982.

Before the original Thukela-Vaal Transfer Scheme phase two was adopted, investigations were carried out for a pumped

storage hydroelectric scheme which would augment the water supply by allowing only a part of the pumped water to be returned for electricity generation. As a result, this phase was amended, and the Drakensberg Pumped Storage Scheme (PSS) constructed instead as a joint venture between the DWA and Eskom. The PSS would replace both the existing Jagersrust station and its proposed extension.

## PUMPED STORAGE SCHEME

The increased annual quantity of water created by the PSS was to be stored in Sterkfontein Dam, and in 1980 it was decided to raise the dam to its present height of 93 m with a crest length of 3 060 m and a full supply capacity of 2 656 million m<sup>3</sup>. The dam wall contains 17 million m<sup>3</sup> of fill and at that time it was the biggest earthmoving job the DWA had ever undertaken. At full level the dam is 19 km long, 6 km wide, with an average depth of 58 m. The raising was finally completed in 1986.

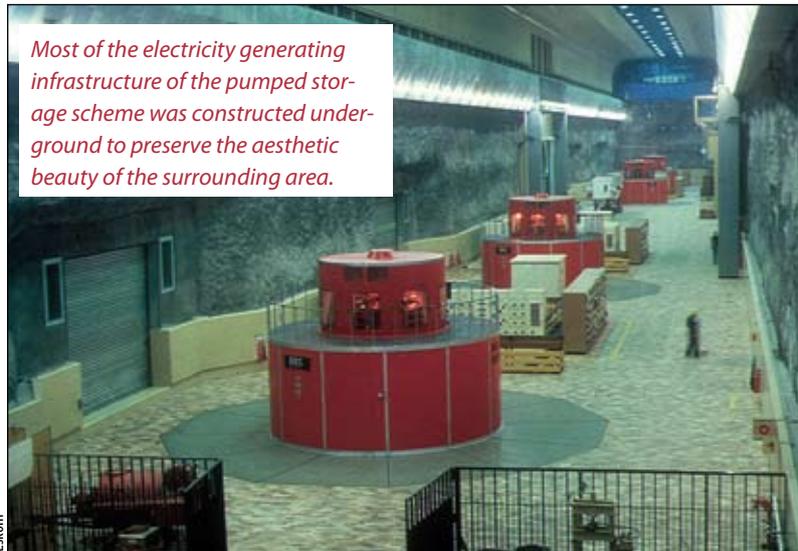
For the lower reservoir, or tail pool, of the PSS, a suitable site was found on the Mnjaneni River on the farm Kilburn situated at the foothills of the escarpment. The required gross storage capacity of 36 million m<sup>3</sup> was created by a dam 51 m high with a full supply level of . Since the water level would fluctuate over a depth of 21 m as the scheme operated, the upstream face of the dam has a flattish slope to improve its stability and is protected by rip-rap. The downstream face is grassed to combat erosion and blend in with the surrounding countryside. The dam has been operational since 1980.

An extra pump station at Jagersrust, named the Kilburn pump station, was erected. The four 250 600 m<sup>3</sup>/day pumps lift the water through a 2 x 1 800 mm-diameter rising main, 1 645 m long.

The upper reservoir is created by the 47 m-high Driekloof Dam constructed across one of the arms of the large reservoir formed by Sterkfontein Dam. This arrangement is rather unusual compared with other schemes in the world as the full supply level of the Sterkfontein reservoir at 1 072 m above sea level is 2 m higher than the full supply level of the Driekloof reservoir. Consequently, for about 12% of the time, the crest of the Driekloof Dam spillway is submerged and the upper 2 m of the Sterkfontein Dam used as the upper reservoir of the PSS.

In addition, the dam design was expected to handle spill either way across the wall and rapid drawdown on the upstream side. This dictated the need for a spillway across the crest. The chosen design was a rockfill dam with a central clay core and, the first of its kind in South Africa, a concrete spillway slab with multiple baffles on the downstream slope. The dam was completed in 1979.

The scheme now operates as follows: water is pumped from Driel Barrage into canals which flow via gravity into Kilburn



*Most of the electricity generating infrastructure of the pumped storage scheme was constructed underground to preserve the aesthetic beauty of the surrounding area.*

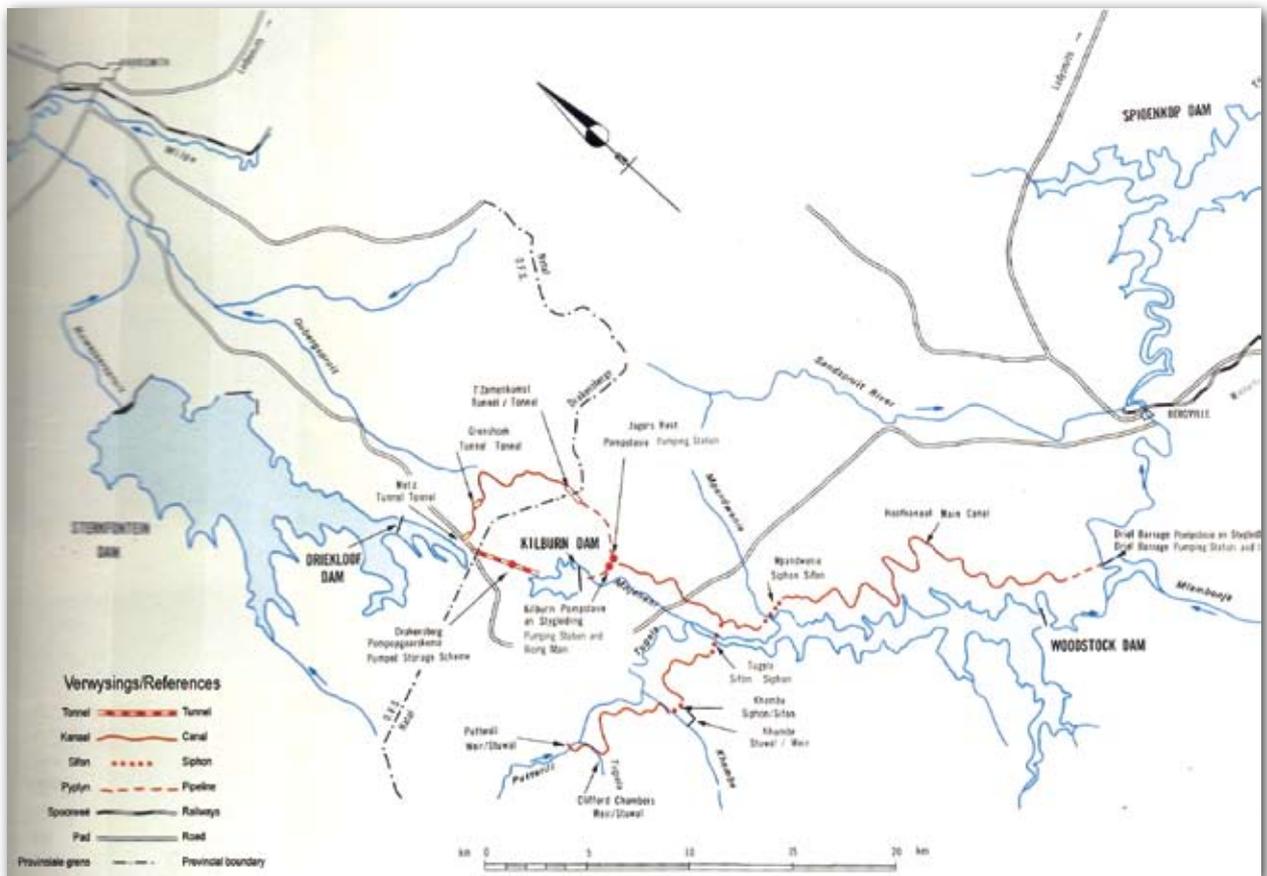
Eskom

## FACTS AND FIGURES

- ◆ At the time of construction, the Drakensberg Pumped Storage Scheme had the sixth highest head in the world (473 m).
- ◆ The Sterkfontein Dam was the first South African dam to be included in the International Commission of Large Dams' register of the world's largest dams.
- ◆ During the drought of 1995, when the level of the Vaal Dam was below 15%, the transfer of water from the Thukela River to the Sterkfontein Dam and releases from this dam to the Vaal Dam were the lifeblood of Gauteng.
- ◆ The distance from Sterkfontein Dam to Vaal Dam is 370 km along the river course.
- ◆ The bottom of Sterkfontein Dam is 158 m above the bottom of Vaal Dam.
- ◆ Because of Sterkfontein's low evaporation rate, it has been calculated that every litre of water pumped into the dam from the Thukela River system makes 3 ℓ of water available from the Vaal Dam.
- ◆ In 1981, the scheme won the award as the Most Outstanding Civil Engineering Achievement from the South African Institution of Civil Engineering.

Dam. Water from Kilburn Dam is then pumped underground, over the Drakensberg, and into Driekloof Dam. At peak periods when additional electricity is needed, water is dropped from Driekloof Dam, through the power station situated underground, and into Kilburn Dam. In quiet periods, water is pumped back from Kilburn Dam and into Driekloof Dam. When the latter is full, water flows into Sterkfontein Dam, where it is stored. When water is needed in the Vaal River system, water is released from Sterkfontein Dam into the Nuwejaarspruit, which then flows into Wilge River and then into the Vaal Dam.

No sooner was the Thukela-Vaal Transfer Scheme completed than it was required to perform its water lifeline function. South Africa experienced a serious drought between 1979 and 1986.



General Layout of the Thukela-Vaal Project.

The accumulative natural flow in the Vaal River during this time was only about 30% of the long-term average flow. By using water from the Thukela River system, serious water shortage could be averted. From 1983 to 1987 more than 1 600 million m<sup>3</sup> Thukela water was released which supplied about 43% of the demand during this period.

## ENVIRONMENTAL CONSIDERATIONS

Up to the 1970s, there was still little pressure on dam engineers to consider the environment when planning and designing projects. Economic considerations, rather than concern for the environment, dictated when, where and how dams were constructed. Only since 1980 has it been the policy of the DWA (now the Department of Water Affairs & Forestry) to include an environmental impact assessment when planning any new infrastructure project.

From the start of the second phase of the scheme concern was expressed over the potential environmental impact of the project on the pristine area in which it was to be located. Following the announcement on 28 June 1974 by Minister Botha of the Drakensberg PSS a committee was appointed to investigate the environmental implications of the project and to make recommendations to minimise adverse effects. The committee held its first meeting on 2 October, 1974.

However, as CPR Roberts and JJ Erasmus point out in a paper published in 1982: "The project was considered to be vital from the point of view of both power generation and water supply to the industrial heart of South Africa and no other feasible alternatives had been identified. For this reason, there could be no question that the project be abandoned for environmental reasons."

However, this is probably one of the first large infrastructure projects in South Africa where concern for the environment dictated how the scheme was planned, designed and executed. For example, one of the decisions was to construct most of the electricity generating infrastructure underground to preserve the aesthetic beauty of the surrounding area. The design and construction of the large underground cavern complex in poor sedimentary rock required the services of top specialists and numerous geotechnical tests. The underground machine hall, for instance, is about 195 m long, 16 m wide and 29 m high, thus its construction was no mean feat.

Another example is Kilburn Dam, where environmental considerations dictated that the haul roads and borrow areas for the earthfill embankment and the designated tip areas for the underground power station works be situated entirely within the basin. This resulted in a congested borrow-haul-tip



*One of the largest dams in the world with no spillway, Sterkfontein Dam was the first South African dam to be included in the ICOLD World Register of Dams.*

configuration and spoon-picking was necessary in the available areas to get sufficient material.

In 1982, as the project was concluded, JF Otto, then DG of the Department of Environmental Affairs noted: "I am particularly pleased with the sensitive way in which the environmental issues, so important in the scenic part of our country in which the Drakensberg Project is situated have been dealt with. The creation of infrastructure brings about unavoidable disturbance of the environment. Close cooperation at an early stage between engineers, landscape architects, botanists, zoologists, and other natural scientists minimised the negative effects."

## THUKELA-VAAL BETTERMENTS

From June 1988, once the first water was received from the LHWP, the Thukela-Vaal canal was shut down for two years for rehabilitation and upgrade. The so-called Thukela-Vaal Betterments project arose when it was found that the sides of the existing canal were being undermined by hydrostatic forces, caused by build-up of groundwater seeping through the surrounding soil.

The problem began when the flow in the canal was increased during the second phase of the transfer scheme. To allow for this the height of the canal was increased through the construction of an 850-mm high, vertical wall right along the top of the existing canal wall. However, this caused surface runoff water from the surrounding area to collect behind the new

vertical wall. The resulting pressures and hydrostatic dynamics of the runoff water behind the wall caused it to crack and eventually subside.

During the betterments project this vertical wall was removed and the extension of the original canal sides upwards done by about 1,8 m for its entire length.

## FUTURE EXPANSION

The development of water infrastructure in the Thukela River for the benefit of users in another catchment might not be over. Today, the Vaal River system is under severe pressure once again. The Integrated Vaal River System Studies, initiated by the Department of Water Affairs & Forestry in 2004, indicated that water demand from Rand Water's service area alone could reach almost 1 800 million m<sup>3</sup>/a in 2030 from the present 1 300 million m<sup>3</sup>/a. This, coupled with growing industrial demand from the power generation, petrochemical and steel production sectors, and severe illegal water use by irrigation farming along sections of the system, has placed the Vaal in a present water supply deficit.

At the time of writing, investigations into additional water transfer options were being finalised. Two schemes are being considered, one being further resource development in the Thukela River system (the other being a further phase of the LHWP). The two proposed dams for further development of the Thukela are one of the Bushman's River (Mielietuin Dam) and the other on the main stem of the Thukela River (Jana Dam). This could provide a nominal transferable yield of 15 m<sup>3</sup>/s.

Since either of these projects will take a couple of years to implement, a decision regarding which project to go ahead with is expected at latest at the beginning of 2009. 

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# Harnessing the COLLYWOBBLES

*Beneath the cover of water, deep deposits of silt have reduced the capacity of the Collywobbles dam.*

Sue Matthews

***Sue Matthews visited Collywobbles in the Eastern Cape and explores ways of mitigating its impact on the surrounding environment.***

The Mbashe River rises in the mountains of the southern Drakensberg, and then snakes eastward across the coastal plateau, a gentle landscape of undulating grassland. Shortly after flowing beneath the N2, the river encounters the more rugged terrain of the Wild Coast, and – as if in shock or confusion – it suddenly flails into a series of violent contortions, before seemingly getting a grip on itself and continuing more sedately to the Indian Ocean.

This convoluted section of river course – viewed on Google Earth as a squiggle of loops and bends – is known as Collywobbles, and is the site of a hydroelectric power station of the same name. It was commissioned in 1985 by TESCOR, the former Transkei Electricity Corporation, and is now operated by Eskom. With three generating units of 14 MW each providing a total maximum output of 42 MW, it ranks as Eskom's third largest hydroelectric power station after the

Gariiep (360 MW) and Vanderkloof (240 MW) schemes on the Orange River. (This excludes the Drakensberg and Palmiet pumped storage schemes, where water is pumped during off-peak periods to generate electricity during peak demand.)

Like many conventional hydropower schemes, Collywobbles has a storage dam and a penstock to pipe water down to the turbines, which drive the generators. What's amazing about this scheme though is that the penstock tunnels straight through the mountain spine separating two bends of the river. This means the water takes a direct shortcut of a little over a kilometre to skip the 34 km 'by the river' meander between the dam wall and the power plant. As a result, this stretch of river barely flows unless water overtops the dam wall during the summer months, when the Mbashe catchment gets most of its rainfall.

Of course, there's a higher demand for electricity in winter, so enough water must be stored to see the power station through the dry months. But the Collywobbles dam was only designed to provide an effective storage of 2,5 GWh – equivalent to 60 hours of operation with all three turbines generating at maximum capacity. Water is therefore diverted from the Ncora Dam on the Tsomo River in the neighbouring Greater Kei catchment, taking about two days to reach Collywobbles. This interbasin transfer of water has ranged between about 115 and 150 million m<sup>3</sup> annually over the last four years.

"In summer we generally have enough run-of-river yield, so most of the water is transferred in winter," explains Monique Klopper, Network Optimisation Analyst for Eskom's southern region, based in East London. "The valve at Ncora Dam is controlled by the Department of Water Affairs & Forestry (DWAF), so we monitor

the levels at Collywobbles and then put in requests to DWAF to release water to us. There's an agreement that the level of the Ncora Dam cannot drop below 50%, and the valve can only be opened 20-35%."

A complicating factor, however, is that the Collywobbles dam has silted up to such an extent that only about 10% of its original 9 million m<sup>3</sup> capacity remains. The soils in the Mbashe catchment are naturally prone to erosion, but overgrazing exacerbates the problem, with the result that more than 60% siltation had already occurred. Clearly, somebody didn't do their homework properly in the planning stages of the scheme.

"At least once a year we'll open the scouring gates at the dam to try and scour out some of the silt, but it doesn't have much effect," says Klopper. "Since we've lost so much of the dam's holding capacity, we can't get the generation out of the station that we'd like." The upshot of this is that while the power station may run round-the-clock during summer, in winter only two of the three units run for a few hours per day over peak demand periods in the morning and evening.

"The operators at the power station check the level of the dam, and if it's overflowing they'll generate more, and stop if it drops too low. We monitor from East London as well to check what's going on," confirms Klopper. "Flow measurements taken by gauging weirs in the river are also fed back to us in East London so we can instantaneously see what the river level is, and generate depending on the rise and fall of the river."

Apart from reducing the dam's capacity, the silt load in the water causes increased wear and tear to the turbine parts. It is also silting up the Mbashe River estuary, which separates the Dwesa and Cwebe Nature Reserves and forms part of the adjoining marine protected area.

"The amount of silt going down the river is a big concern for us, and we're always on the lookout for ways to mitigate the

effects. That's why we can't scour as much as we'd like," says Klopper.

Yet the presence of the dam and the interbasin transfer of water in winter completely alters the flow regime of the river, which contributes to the siltation problem and also affects the system's ecological functioning. According to DWAF's Internal Strategic Perspective of the Mzimvubu to Mbashe ISP Area (2005), the natural run-of-river yield

determined using the Rapid Simulation Model is 67 million m<sup>3</sup> per year – about half the amount of water transferred from Ncora Dam.

The relationship between freshwater flows and the state of the estuary, as well as the consequences for its habitats and biota, will be examined in a desktop assessment that form part of a project to develop an estuary management plan for the Mbashe River.



Sue Matthews

*The machine floor at Collywobbles hydroelectric power station, showing the three 14 MW generating units.*

The Eastern Cape Parks Board has commissioned the study, under the auspices of the CAPE (Cape Action Plan for People and the Environment) Estuaries Management Programme. Options for rehabilitation of the estuary are to be identified, and perhaps some operating rules for the Collywobbles scheme can be suggested to reduce its impact. Because despite all its problems, Eskom is not likely to give up on the scheme in the near future – especially in the current era of countrywide power shortages and the looming threat of rolling black-outs.

“Collywobbles is important in terms of electricity supply, but more so in terms of the stability of the network, as it can keep the network running during high demand periods or temporary shortages,” explains Klopper. “The return we get on it is enormous, plus it’s a clean source of energy.”

Electricity generated at Collywobbles is distributed remotely from East London, with most directed to Mthatha (formerly Umtata) and other towns and villages in Transkei – some quite close to the point of origin. The Mbashe River flows through one of the poorest and most undeveloped areas of the country, where 77% of the inhabitants earn less than R800 per month. Census 2001 revealed that there were 253 372 people (53 199 households) living in the Mbashe municipal area, which includes the towns of Dutywa, Gatyana (Willowvale) and Xhora (Elliotdale), but 95% of residents live in rural settlements

### WHAT'S IN A NAME

Collywobbles was named after Sir George Pomeroy Colley, who served as Special Magistrate in the Dutywa District for two years from 1858.

The story goes that on first seeing the river’s maze of canyons, he exclaimed: “My, it wobbles!”

“Yes, sir,” responded a quick-witted aid.

“Collywobbles!”

Colley was later promoted to the rank of Major-General, and was killed during the First Boer War’s Battle of Majuba in 1881.



Sue Matthews

*Plant operator Lucas Ngqata (seated), electrical officer Fundile Mgulugulu (left) and mechanical officer Lungile Madlolo (right) in the Collywobbles control room.*

on tribal land. In the gaily painted bungalows scattered throughout the countryside, people burn paraffin, candles, wood and gas – or even cow dung and maize cobs – for cooking, light and warmth, but more than 25% of villages have electric power. Indeed, according to the Mbashe Municipality’s draft Integrated Development Plan for 2008-2009, about 60% of all households now have access to electricity, and Eskom is extending its reach little by little.

Water services are the more pressing problem, since only 0,63% of households have access to water inside the home, while 67% rely on streams and rivers for their water requirements. DWAF’s ISP report indicates that rural people in the upper catchments must deal with annual water deficits during the dry season, limiting their domestic uses and stock watering. The situation is exacerbated by the 24 600 ha (246 km<sup>2</sup>) of forestry plantation here, which reduces annual runoff by an estimated 19 million m<sup>3</sup>. Any expansion of this land use – as promoted through the government’s afforestation plans for 100 000 ha in the Eastern Cape – will put the system and its dependent communities under severe pressure.

With all the water being transferred from Ncora Dam, however, there’s a substantial surplus of water downstream of Collywobbles. The ISP report suggests that consideration is given to making this water available for other uses that could create economic opportunities. It points out, though, that the potential for

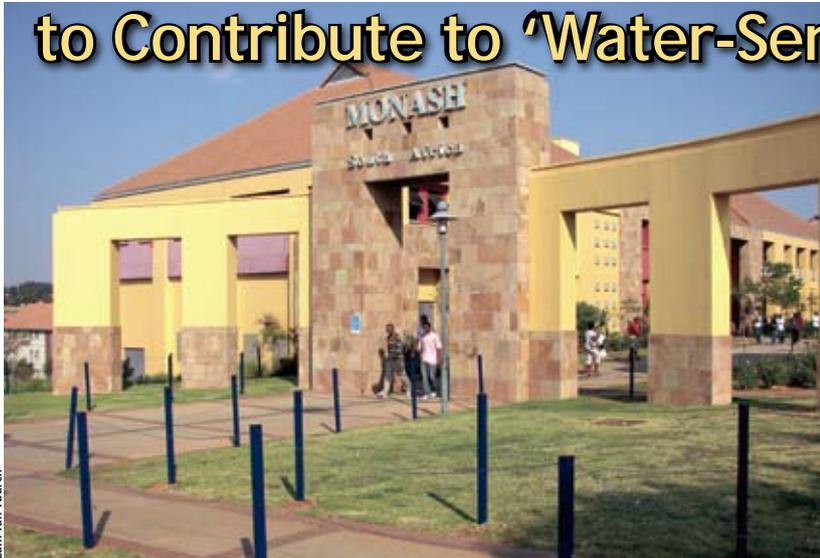
crop irrigation is limited due to the area’s poor soils and steep terrain.

A bit further north, however, the twin benefits of irrigation and hydroelectricity are being touted as the main motivation to dam the Mzimvubu River, which flows into the sea at Port St Johns. This is South Africa’s largest remaining undeveloped river, but the massively ambitious Mzimvubu Basin Development Project is set to change this. The numbers being bandied about are that some 897 000 jobs would be created through forestry and agricultural expansion, and as much as 2 000 MW of hydroelectricity generated for the national grid through a network of large dams. Eskom has reportedly identified nine possible hydropower sites on the Mzimvubu River and its main tributaries.

Apart from Collywobbles, Eskom inherited three other small hydropower stations from TESCOR. The smallest is Ncora (2 MW), situated alongside the dam of the same name. Some of the water transferred to Collywobbles is routed via the Ncora plant, so it effectively generates electricity twice. First Falls (6 MW) and Second Falls (11 MW) lie below the Mthatha Dam, but they too can only operate over peak periods in winter to ensure that the city of Mthatha’s water supply is not compromised.

Hopefully, before the mighty Mzimvubu is shackled by a chain of dams, the true costs and benefits of hydropower schemes will be carefully considered, and lessons learned from past mistakes.

# NEW RESEARCH NODE to Contribute to 'Water-Sensitive' Future



Lani van Vuuren

*Lani van Vuuren attended the launch of the IWC Africa Water Research Node at Monash South Africa in Johannesburg, which hopes to contribute to the country's key water resource management challenges through scientific research and education.*

The Water Research Node (WRN) enjoys support from both Australia's Monash University and the International WaterCentre, a private sector organisation focused on education, research and consultancy to build capacity in integrated water management. Headed by Director Dr Dirk Roux the WRN hopes to contribute much-needed research capacity to the critical area of sustainable development, wise governance and effective management of fresh water.

"National and catchment-based assessments indicate that freshwater ecosystems are more threatened than marine and terrestrial ecosystems and that, in general, their state is declining further. At the same time we need more water for a growing population, social upliftment and economic development," Dr Roux tells *the Water Wheel*. "The vision of the WRN is to be a leading research and education unit for building capacity to facilitate a transition towards a 'water-sensitive' future."

The WRN hopes to contribute in three ways, firstly, through research, by promoting and facilitating novel, interdisciplinary and use-inspired research. Secondly, through education,

by inspiring post-graduate students to become thought and action leaders in the water sector. Lastly, through community engagement, by co-learning and co-creating solutions with appropriate segments of society that promote adoption of new knowledge and influence change towards more sustainable pathways in water resource management.

The WRN does not aim to compete against existing South African water research centres. In fact, several organisations have already expressed their willingness to cooperate with the node and a number of collaborative projects are being initiated at present.

"Within the global scientific enterprise, no individual or organisation can claim complete ownership of any field of study. In the long term, success in research depends on effective participation in the broader learning system," notes Dr Roux. "The new WRN represents a portal to the substantial knowledge resources of at least two world-class organisations that are both keen to grow their contributions in Africa."

While the funds for research originate in Australia, the WRN is clear on its Africa focus. Monash South Africa is explicit

about its intention to focus its research on issues of concern in contemporary Africa. Similarly, the IWC aims to align its research with the needs of developing countries and to have a measurable impact towards better management of water. "We believe that local relevance and international recognition are not mutually exclusive but complementary outcomes of research," concludes Dr Roux. 



Monash South Africa

*At the launch of the IWC South Africa Water Research Node are Dr Dirk Roux, Director: Water Research Node; Mark Pascoe, Chief Executive: International WaterCentre; Prof Dina Burger, Deputy Pro Vice-Chancellor, Research; and Prof Tyrone Pretorius, Pro Vice-Chancellor, Monash South Africa.*



# Helping Hand for Small Water Treatment Plants

*To aid government in its quest to improve the quality of drinking water served to rural communities, the Water Research Commission (WRC) has published a new set of guidelines for small water treatment plants.*

*Lani van Vuuren reports.*

**W**ater infrastructure in South Africa is generally well developed in urban areas. However, rural water treatment plants are often wrought with technical and management problems leading to the production of drinking water of an inferior quality with potential health consequences for affected communities.

To unravel the intricacies around the operational and management parameters impinging on the disinfection efficiency of these small water treatment plants the WRC funded a study involving 181 such plants (mostly municipal owned) across seven provinces. The goal was to determine the nature and full extent of the problems currently being experienced so as to provide

practical and user-friendly guidelines for intervention.

The study, led by Prof Maggie Momba from the Tshwane University of Technology, gathered information on the methods of disinfection applied, equipment employed, performance of the treatment plants, knowledge and skills of the operators as well as other technical and management issues, among others. It shed significant light on the challenges hampering the performance of the country's small water treatment systems.

Of the small water treatment plants surveyed, those in the Free State were found to deliver the best water quality, while those in the Eastern Cape

generally delivered the poorest quality water. The primary reasons for the failure of these plants included inappropriate technology, poor operation, lack of training, municipal financial constraints, lack of motivation of operators and lack of knowledge of basic water treatment operations.

## **CONTROL AND MONITORING**

At most water treatment plants the characteristics of the incoming (raw) water will change from time to time demanding adjustments in the treatment process. Furthermore, there are variations in water demand which may require changes in raw water flow rate.

Around 50% of the operators and supervisors interviewed did not display the knowledge of the flow rates at which their plants operated and more than 78% were unaware of the chemical doses used or how to correlate the required dose to the flow rate. This often led to either an overdose or an underdose of coagulant and chlorine.

The general lack of skills of plant operators and supervisors was found to be particularly concerning. In some provinces, up to 60% of operators had not undergone relevant and appropriate training to enable them to acquire the necessary technical skills for the job. This is despite the fact that a number of training programmes exist in the country. "We found that many operators have a low level of formal education, and thus may find formal course material difficult to follow," explains Prof Momba. "Increased on-site training offered in local languages could improve the situation."

In terms of instrumentation, only 46% of plants surveyed had the instruments to measure turbidity, pH and chlorine residual (in some cases swimming pool kits were being used to measure pH and chlorine). While 95% of the plants reported that an external monitoring group visited the plants regularly (about once a month), most plants complained about a lack of feedback. In virtually all the plants studied, inadequate funding for operational and implementation activities was mentioned as a huge drawback for effective and efficient water services delivery.

### POOR MAINTENANCE PRACTICES

Lack of maintenance of equipment was noted to be a major maintenance problem in about 60% of the small water treatment plants studied. This led to periodic equipment failures. Many operators interviewed felt that the culture in most small water treatment plants was one of 'repair or replace' rather than one of regular maintenance.

In addition, poor working conditions, depletion of chemicals (due to inadequate record keeping), the lack of emergency preparedness and poor communication were found to be significant contributors to the failure of these systems.

### DISTRIBUTION SYSTEM

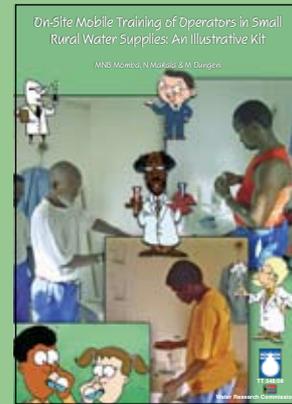
The quality of water reaching consumers depends not only on operating conditions at the treatment plant but also on changes occurring in the distribution system. The study revealed that at many plants final drinking water of the highest quality might be leaving the plant but its condition deteriorated before reaching consumers. High turbidity in the finished water, aged pipelines, breaks in distribution pipelines, biofilm growth, and sludge accumulation in storage reservoirs were some of the factors contributing to this occurrence.

The resultant guidelines describe methods and processes for tackling some of these problems experienced at small water treatment plants. Practical solutions are offered, with emphasis on the multiple barrier approach to optimising disinfection.

In addition, the survey results have been shared with relevant stakeholders with an emphasis on the areas where water quality problems are being experienced. Nationwide workshops on the emergency disinfection of drinking water were also held earlier this year. "Much is already being done to improve drinking water quality in rural areas," notes Prof Momba. "It is important that everyone in the water sector works together to assist municipalities to provide the best quality water to their communities."

To order the Guidelines (**Report No: TT 355/08**) or related report, *Improving Disinfection Efficiency in Small Drinking Water Plants* (**Report No: 1531/1/08**) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-3565 or E-mail: [orders@wrc.org.za](mailto:orders@wrc.org.za) 

## ON-SITE TRAINING MATERIAL FOR OPERATORS



An illustrative training kit for rural water treatment plant operators is now available from the WRC.

In rural treatment plants there is a need for most operators to upgrade their training in order to achieve the necessary improvements in performance to produce water that is consistently safe to drink. While formal training in a classroom does have its benefits, operators with a low level of formal education may find the presentation of the course material difficult to follow.

This illustrative kit is the end-product of a series of on-site mobile training of 26 operators from seven different small water treatment plants in the Eastern Cape. It emphasises why each step in water treatment is important for the sustainable production and delivery of safe drinking water and how to check the performance at each stage.

To order *On-Site Mobile Training of Operators in Small Rural Water Supplies: An Illustrative Kit* (Report No: TT 348/08) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565 or E-mail: [orders@wrc.org.za](mailto:orders@wrc.org.za)

## Exploring the Link Between Water and HIV

On 1 December the world will celebrate the 20<sup>th</sup> anniversary of World Aids Day. The theme for this year is 'leadership' to encourage leaders at all levels to stop the disease.

HIV infection has reached epidemic proportions. According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), AIDS has killed more than 25 million people since it was first recognised on 1 December, 1981, making it one of the most destructive pandemics in recorded history. It is estimated that about 0,6% of the world's population is infected with HIV. Last year about 2,7 million people were newly-infected. More than 6 000 lives are lost every day to the disease.

### AIDS IN SOUTH AFRICA

AIDS continues to be the leading cause of death in Africa which is home to 67% of all people living with HIV. In Africa, 60% living with HIV are women and three out of four young people living with HIV are female.

South Africa has one of the highest prevalence of HIV in the world. While the epidemic seems to have stabilised in South Africa a significant proportion of people in the country are living with the disease. At present, the country has an estimated 5,7 million people living with HIV.

According to the Human Sciences Research Council (HSRC), HIV prevalence by province shows that among people aged two years and older KwaZulu-Natal (16,5%), Mpumalanga



*HIV strikes people across lines of race, gender and social standing, however, informal settlements have been shown to have the highest incidence of HIV.*

(15,2%) and Free State (12,6%) have the most people living with HIV. Among those aged between 15 and 49 the HIV prevalence is highest in Mpumalanga and KwaZulu-Natal. People living in informal settlements have by far the highest HIV prevalence.

### AIDS & WATER

AIDS is not a water-related disease, and HIV is not spread via contaminated water or poor hygiene. Yet there is a more important link between HIV/AIDS and water than people realise.

Easy access to safe and sufficient water and sanitation is indispensable for people living with HIV/AIDS. Diarrhoea and skin diseases are among the most common opportunistic infections in people living with the disease. For some patients, diarrhoea can become chronic, weakening them even more.

In order for HIV-infected people to remain healthy as long as possible and for people with AIDS to reduce their chances of getting diarrhoea and skin diseases, adequate water supply and sanitation facilities are of the utmost importance, especially if people do not have access to antiretroviral treatment. Clean water is also needed to take medicines.

Good-quality water is also crucial for HIV-positive mothers who cannot breastfeed their babies for fear of infecting them. Unsafe water used in infants' feed increases the risk of diarrhoeal diseases and infant mortality.

### ONLINE RESOURCES

Aids Foundation South Africa ([www.aids.org.za](http://www.aids.org.za))  
Human Sciences Research Council ([www.hsrc.ac.za/Media\\_Release-256.phtml](http://www.hsrc.ac.za/Media_Release-256.phtml))  
South African Department of Health ([www.doh.gov.za](http://www.doh.gov.za))  
Wikipedia (<http://en.wikipedia.org/wiki/HIV>)  
Treatment Action Campaign ([www.tac.org.za](http://www.tac.org.za))  
Water Research Commission HIV/AIDS DVD for councillors ([http://www.wrc.org.za/hiv\\_water\\_vid.htm](http://www.wrc.org.za/hiv_water_vid.htm))  
International Water & Sanitation Centre (<http://www2.irc.nl/page.php/114>)

## WHAT IS AIDS?

Acquired immune deficiency syndrome (AIDS) is the final and most serious stage of HIV disease, which causes severe damage to the immune system. Human immunodeficiency virus (HIV) causes AIDS. The virus attacks the immune system and leaves the body vulnerable to a variety of life-threatening infections. Common bacteria, yeast, parasites and viruses that ordinarily do not cause serious disease in people with healthy immune systems can cause fatal illnesses in people with AIDS.

The virus can be transmitted: through sexual contact, through blood (for example, through the sharing of needles), and from mother to child (for example through breastfeeding). HIV is not spread by casual contact such as hugging, by touching items previously touched by a person infected with the virus, during participation in sports or by mosquitoes.

There is no cure for AIDS at this time. However, a variety of treatments are available that can help keep symptoms at bay and improve the quality of life of those who have already developed symptoms, for example, antiretroviral therapy.

Source: [www.healthline.com](http://www.healthline.com)



Chris Kirchhoff/Media Club SA

*We all need to be educated about HIV/AIDS.*

## HIV/AIDS FACTS AND FIGURES

- ◆ South Africa has the sixth-highest prevalence of HIV in the world, with 28% of the population estimated to be infected.
- ◆ Women face a greater risk of HIV infection. On average in South Africa there are three women infected with HIV for every two men who are infected. The difference is greatest in the 15-24 age group, where three young women for every one young man are infected.
- ◆ HIV in children is high. Approximately 130 000 children aged between two and four and about 214 000 children between five and nine are HIV positive. Most of them have had HIV since birth.

In South Africa, home-based caregivers provide critical support for people who are HIV infected. They require up to 200 litres of water per day for every patient. Water is needed to bath patients and for washing soiled clothing and linen. Finally, water is needed to keep the house environment and toilet clean in order to reduce the risk of opportunistic infections.

## QUALITY SERVICES WITHIN REACH

For people weakened by disease it also becomes important that water-supply points and toilets are easily accessible and close to where they are needed. This not only reduces the burden of long-distance water collection, for example, fetching water on caregivers or those who are weak. Critically too, it cuts the risk of girls and women being attacked while fetching water or relieving themselves in remote places, and thus reduces vulnerability to infection with HIV.

In addition, the design of water-supply and sanitation infrastructure needs to take into account, for example, those fetching water are now children or older people who have particular requirements (pump handles not too high, pumping not too heavy, etc). This is because water collection tasks are increasingly falling on children and the elderly as a consequence of AIDS. Toilet structures, on the other hand, need to be big enough to accommodate more than one person (for example, when weakened patients require assistance to go to the toilet).



## WHERE DOES THE RED RIBBON COME FROM?

The Red Ribbon was created in 1991 by the Visual AIDS Artists Caucus in New York, USA. It has since become the international symbol of HIV and AIDS awareness. People wear the ribbon to demonstrate their care and concern about the disease. It is also a symbol of hope – that the search for a vaccine and cure to halt the suffering is successful and the quality of life improves for those living with the virus.

Source: UNAID

# Successful Workshop on Modelling & Biomanipulation

*The North West University Potchefstroom Campus along with the Department of Water Affairs & Forestry organised a successful workshop on the Applicability of Modelling Techniques and Biomanipulation in the Aquatic Environment at the Roode Valley Country Lodge. A number of international specialists presented at the workshop, including ecological informatics expert Prof Friedrich Recknagel from Adelaide University and Prof Erik Jeppeson from the University of Aarhus, Denmark, who specialises in aquatic ecology.*



Lani van Vuuren

*A total of 26 people are employed on the hyacinth removal project on the Roodeplaat Dam.*



Lani van Vuuren

*Ecological informatics expert Prof Friedrich Recknagel from Adelaide University was one of the international speakers at the workshop.*



Lani van Vuuren

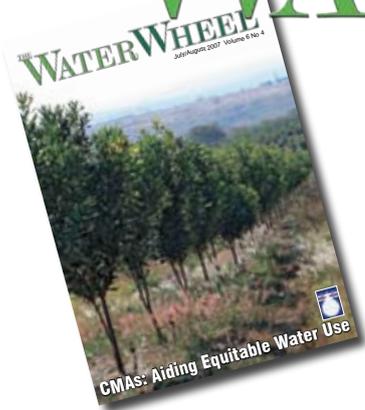
*Dr Bill Harding, one of the few remaining limnologists in the country, delivered several presentations at the workshop.*



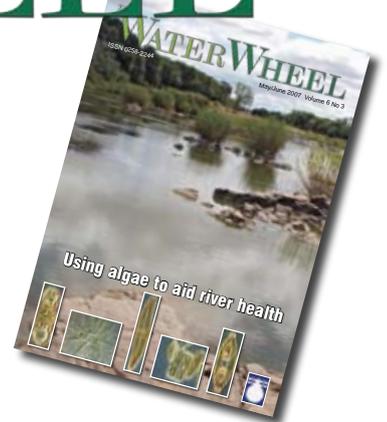
Lani van Vuuren

*Workshop participants were taken by boat on to Roodeplaat Dam to view the present hyacinth clearing project. More than 37 ha of hyacinth has been removed by hand since February.*

# THE WATER WHEEL



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## Water Research Commission

Invests in the creation, dissemination and application of knowledge in five Key Strategic Areas (KSAs)

### **KSA 5 Water-Centred Knowledge**

### **KSA 1 Water Resource Management**



### **KSA 2 Water-Linked Ecosystems**

### **KSA 3 Water Use and Waste Management**

### **KSA 4 Water Utilisation in Agriculture**

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